Efflorescence – Causes, Prevention and Removal

TDS 159

The occurrence of efflorescence is a potential problem whenever portland cement products are used.

Efflorescence is a white crystalline deposit which is composed of salts, lime and/or other soluble minerals. Efflorescence may become visible on many types of building product surfaces such as concrete, stucco, grout, masonry, brick, natural stone, clay, ceramic and even wood. These salts and minerals are water-soluble and generally come from the ground or where cementitious or alkali substances exist. These salts and minerals travel to the surface, using water as their transport mechanism, where exposure to the environment evaporates the water and exposure to carbon dioxide changes the deposits chemically leaving behind salts and minerals (white residue) on the surface.

There have been many industry articles and resources available that speak on the issue of efflorescence. It is important to note that efflorescence is not considered a defect of the installation materials, but rather a naturally occurring issue common to all portland cement based products.

The best way to prevent efflorescence is to better understand what it is and how it happens. Three things have to happen for efflorescence to become a problem;

1. There must be soluble salts present (these salts are present in portland cement products from the manufacturing process), 2. Water must be present in the setting bed, mortar bed and/or grout, and 3. Some type of force (evaporation, gravity, capillary movement, etc...) has to bring the salts to the surface of the installation.

Salts can then be put into solution and brought to the surface. If all 3 things occur then the water evaporates, the salts remain on the surface where they react with carbon dioxide in the air. The reaction turns the salts into a visible white material that collects on the surface. These salts can be calcium carbonate, sodium carbonate, potassium carbonate, or calcium hydroxide depending on the source of the portland cement raw materials and any additives that may have been added to the concrete or mortar.

Eliminating any of the 3 needed circumstances will eliminate the occurrence of efflorescence. It is important to note that efflorescence may occur again if all three of the factors which cause efflorescence are not dealt with, even if a suitable sealer is used.

The best ways to help minimize the occurrence of efflorescence are;

1. Use a polymer fortified thin-set (e.g. 254 PLATINUM, 254 PLATINUM Plus , MULTIMAX™ LITE or MULTIMAX™ 1 Pre-Mixed Adhesive);
2. Use a calcium aluminate cement based grout (e.g. PERMACOLOR® Select, PERMACOLOR Grout, or PERMACOLOR Select NS);
3. Slope the area to evacuate water from the surface to the sides of the installation - if most of the moisture moves away from the slab then there is less of a chance for efflorescence to occur.

For exterior installations over occupied space, we would recommend the use of the Plaza and Deck System. This system prevents much of the moisture from staying in the mortar bed as it allows for runoff of water that gets beneath or into the mortar bed.

Unfortunately, as this point, there is no clear cut answer for the total elimination of efflorescence. The use of an epoxy setting material (e.g. LATAPOXY® 300 Adhesive or LATAPOXY BIOGREEN 300) may also help reduce efflorescence, but no guarantee can be provided that efflorescence won't occur.

Removal of Efflorescence from Surfaces Which Are Not Sensitive to Acid (e.g. granite, slate, clay brick, etc…)

Most types of efflorescence are acid-sensitive and because they are typically a buildup of limes, salts and/or soluble mineral deposits usually dissolve when in contact with acid. Since efflorescence is sensitive to acid, STONETECH® Restore™ Acidic Cleaner, a heavy duty acidic cleaner, works well in dissolving and removing efflorescence in most instances. It is good practice and strongly recommended to conduct a test area in an inconspicuous area to determine suitability and acceptability. If it is determined that the procedure is acceptable then follow the application instructions below:

1. Mask off and protect any surrounding areas that will not be treated. Cover or protect any steel or metal (especially if used interior) to protect from acid corrosion.
2. Apply mixed solution at the light duty dilution level as listed on the product label. Stronger dilutions may be used if required.
3. Apply to the surface using clean mop, towel, sponge, or sprayer. Be careful not to apply to areas which are not affected by efflorescence.
4. Agitate with a stiff white nylon scrub brush, white nylon pad, or appropriate floor machine. (do not use colored pads or brushes as this can lead to color bleeding in the substrate)
5. Rinse area with a lightly dampened clean mop, sponge, towel or wet vacuum. Do not over apply rinse water. Water is one of the key factors in the development of efflorescence. Rinse well enough to remove any cleaner residues only. **DO NOT OVERWET**.
6. Allow the surface to completely dry to determine the desired results. Repeat as necessary.
7. Sealing the surface using a STONETECH penetrating sealer (e.g. STONETECH BulletProof®, STONETECH Heavy Duty Sealer, etc…) should minimize efflorescence from recurring.

Removal of Efflorescence from Surfaces Which Are Acid Sensitive (e.g. marble, limestone, concrete, travertine, etc…)

STONETECH RESTORE is an acid-based product which, when applied to acid-sensitive surfaces, can react with the surface and alter its appearance. If an acid-sensitive surface is already textured, this may not cause a problem which is noticeable. If this is the case, you should conduct a test area in an inconspicuous area to determine suitability and acceptability. If the user determines that this procedure is acceptable, then proceed as directed above.

To remove efflorescence from acid-sensitive surfaces follow these application instructions below:

1. On flat surfaces, remove the efflorescence by using a dry, white nylon scrub pad and by hand or rotary sander with the white nylon pad attached. Oftentimes, most of the efflorescence deposits can be removed following this process.
2. If this process does not completely remove the efflorescence, or on textured surfaces where the above step is not possible, mechanical refinishing maybe required.
3. Once surface has been mechanically refinished it to the desired look then resealing the surface using a STONETECH penetrating sealer e.g. STONETECH BulletProof®, STONETECH Heavy Duty Sealer, etc…) should minimize efflorescence from recurring.

For the Builders of a Better World™

LATICRETE International, Inc ■ One LATICRETE Park North, Bethany, CT 06524-3423 USA ■ Tel 1.203.393.0010 ■ Toll Free 1.800.243.4788 ■ Fax 1.203.393.1684 ■ laticrete.com